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Randal Barker 1766
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NEW

PRACTICAL
IMPROVEMENTS,
AND
OBSERVATIONS
On Some of the
Experiments and Considerations
TOUCHING
COLOURS.

Of the HONOURABLE and JUDICIOUS

ROBERT BOYLE, Esq;

So far as they relate to TINCTURES and
PIGMENTS;

Intended for the Use of Gentlemen and Ladies
that amuse themselves with Painting in Water
Colours, as well as Designers and Limners, &c.

By JOHN HOOFNAIL.

L O N D O N :

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(Price One Shilling.)

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PHARMACEUTICAL
IMPROVEMENTS
AND
OBSERVATIONS
ON THE
PREPARATION AND COMPOSITION
OF
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So far as they relate to TINCTURES and
PILLS.

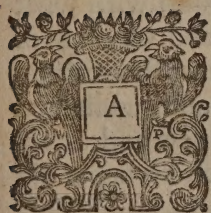


(Price One Shilling)



T H E

P R E F A C E.



S it may be thought a Pre-
sumption in me to give this
little Work the Name of
Improvements on Mr *Boyle's*
Experiments, as if I in-
tended thereby to insinuate
that those valuable Experiments were imper-
fect, I judg'd it not amiss, by Way of Apo-
logy, to assure the Reader that I have too great
an Esteem for all the excellent Performances
of that truly Noble and Experienced Author,
not to pay them the Deference, and to peruse

iv *The* PREFACE.

them with that Admiration, they so justly deserve.

When first I took these Essays into my Hands, I indeed expected (not knowing the Nature and Design of them 'till I read them) to find nothing but Recipes ready for me to apply directly to the Purposes I wanted them for; but I had not gone over some few of them without being soon convinced of my Mistake, and easily discovered that the Honourable and Generous Author had designed these Elaborate Peices only, as Foundations for others to improve and build upon.

This indeed was a great Disappointment to me, and render'd the Work I had in hand more difficult than I could have wish'd; but as I was determin'd to go through with what I had begun, the repeating and varying of the Processes soon gave me the Satisfaction of seeing my unlook'd for and additional Trouble well rewarded with new and useful Appearances and Effects, which perhaps did not appear to that Gentleman, as he acted on more sublime Principles, and with more extensive Views than Persons of my infinitely inferior Capacity can pretend to.

In this Sense it is, therefore, that I have taken the Liberty of calling the few following *Tentamina*, Improvements on Mr Boyle's Expe-

The PREFACE.

V

Experiments, and hope that, when taken in this Light, I shall not be censured by the World as assuming an improper Title, or of attempting to eclipse the Glory of one of the greatest Men the Learned World has ever been honoured with.

It may likewise be surmised, that the many Treatises that have appeared in the World on this Subject both before and after the Writing of Mr *Boyle's* Essays, will make this Work unnecessary, useless, and even superfluous ; to take away the Force of this Objection, I will only add, that as my natural Aversion to impose any Thing upon the Public, that was copied from others (as has been, too frequently done, without trying whether the Things they published were agreeable to Truth) would have been sufficient to hinder me from this Undertaking, so I have offered nothing in the following Sheets, but what I have myself experienced. And as I don't remember to have seen any Thing herein contained, in the many Authors I have read on this Subject ; I thought my Labours might not be altogether useless, unprofitable, or unacceptable to the curious as well as the Artist, to whose Patience and Favour I recommend them, and whose Approbation I shall be very proud of.

Note,

Note, For the Ease and Conveniency of those Readers, that have not Leisure to have recourse to Mr Boyle's Essays, and others who have not that Book by them, I have transcribed from that Author the Experiments whereon the following were made, and placed them at the Head of the Improvements on each of them ; whereby it will at once appear what the Design of those Experiments was, and of what Use my Operations thereon will be.



THE

T H E C O N T E N T S.

M R Boyle's 20th and 21st Experiments,	
	Pag. 2 and 4
<i>Observations thereon</i>	6
<i>Various Tinctures made from Litmus</i>	9
<i>Lakes or Powders made from ditto</i>	11
<i>Mr Boyle's 22d Experiment</i>	12
<i>Observations thereon</i>	15
<i>Several Tryals on Verdigrease</i>	16
<i>Useful Tinctures made of it</i>	17
<i>Powders made from it for painting in Oyl and Water</i>	ibid.
<i>A good Green Tincture from Verdigrease to stain Ivory, &c.</i>	20
<i>Mr Boyle's 24th Experiment</i>	22
<i>Observations thereon</i>	24
<i>Several Experiments on the Cochineals</i>	26
<i>Useful Tinctures made of them</i>	27
<i>Lakes from Cochineal</i>	29
<i>Tinctures from Kermes Berries and from Madder</i>	31
<i>Lakes from them</i>	ibid.
<i>A Purple Tincture from Cochineal</i>	32
<i>Mr Boyle's 26th and 29th Experiments</i>	33, 34
<i>Tryals and Observations thereon</i>	40
<i>Sap-Green considered</i>	ibid.
<i>Tinctures made therefrom</i>	41
	Mr

The CONTENTS.

<i>Mr Parkinson's Account of the Buckthorn Berries</i>	Page 43
<i>Remarks thereon</i>	44
<i>Conjectures about the Sap-Green</i>	45
<i>Mr Boyle's 49th Experiment, &c.</i>	46
<i>Observations thereon</i>	49
<i>A Yellow Powder from Sap-Green</i>	51
<i>A Yellow Tincture from the Berries of Avig-</i> <i>non</i>	<i>ibid.</i>
<i>A Yellow Lake, or Dutch Pink from ditto, ib.</i>	
 <i>Farther Remarks on the 49th Experiment.</i>	 52
 <i>A Yellow Tincture from Gamboge</i>	 <i>ibid.</i>
<i>A Yellow Tincture from Woold</i>	54
<i>A Powder from ditto</i>	<i>ibid.</i>
<i>A Gold Colour Tincture from Anotto</i>	<i>ibid.</i>
<i>A Powder from ditto</i>	<i>ibid.</i>
<i>A Tincture from Japan Earth</i>	55
<i>A Powder from ditto</i>	56
<i>Some Conjectures and Thoughts concerning the</i> <i>Japan Earth</i>	<i>ibid.</i>
<i>Directions for staining Paper, with the be-</i> <i>fore-mentioned Tinctures</i>	57
<i>The Preparation of the Prussian Blue</i>	59
<i>A Way to make Prussian Green</i>	61
<i>A Purple Powder on the same Basis</i>	62
<i>A Yellow ditto</i>	<i>ibid.</i>
<i>The Conclusion</i>	<i>ibid.</i>
<i>Some additional Observations</i>	63



PRACTICAL
IMPROVEMENTS, &c.



H A T the Method I have taken in setting down the following Trials, by beginning at the twentieth of Mr *Boyle's* Experiments, may not appear strange and irregular, it will not be improper to acquaint the Reader, that hitherto I have found nothing in any of the preceding, intermediate, and the subsequent Experiments not here taken Notice of, but what either not related to, or interfered with the present Subject, and therefore make no Mention of them. This being what I thought necessary to premise, shall proceed to the Business.

EXPERIMENT XX.

“ **T** A K E good Syrup of Violets,
“ impregnated with the Tincture
“ of the Flowers, drop a little of it upon
“ a white Paper (for by that Means the
“ Change of Colour will be more conspi-
“ cuous, and the Experiment may be
“ practised in smaller Quantities) and on
“ this Liquor let fall two or three Drops
“ of Spirit, either of Salt or Vinegar ; or
“ almost any other eminently Acid Li-
“ quor, and upon the Mixture of these
“ you shall find the Syrup immediately
“ turn’d Red, and the Way of effecting
“ such a Change, has not been unknown
“ to divers Persons who have produced
“ the like, by Spirit of Vitriol, or Juice
“ of Lemons, but have groundlessly ascribed
“ the Effect to some peculiar Quality of
“ those two Liquors, whereas (as we have
“ already intimated) almost any Acid
“ Salt will turn Syrup of Violets red. But
“ to improve the Experiment, let me add
“ what has not (that I know of) been
“ hitherto

touching COLOURS. 3

“ hitherto observed, and has, when we
“ first shewed it them, appear'd something
“ strange, even to those that have been
“ inquisitive into the Nature of Colours,
“ namely, that if instead of Spirit of Salt,
“ or that of Vinegar, you drop upon the
“ Syrup of Violets a little Oil of Tartar
“ *per Deliquium*, or the like Quantity of
“ Solution of Pot-ashes, and rub them to-
“ gether with your Finger, you shall find
“ the blue Colour of the Syrup turn'd in
“ a Moment into a perfect Green, and the
“ like may be perform'd by divers other
“ Liquors, as we may have Occasion else-
“ where to inform you.

The Annotation on this Experiment
differing little from what is there said,
except what relates to the *Lignum*
Nephrriticum, it is useless to transcribe
it.

4 *Practical Improvements*

EXPERIMENT XXI.

“ **T** H E R E is a Weed, more known
“ to Plowmen than beloved by
“ them, whose Flowers from their Colour
“ are commonly called Blew-bottles, and
“ Corn-weed, from their growing among
“ Corn. These Flowers some Ladies do,
“ upon the Account of their lovely Colour,
“ think worth the being Candied ; which
“ when they are, they will long retain so
“ fair a Colour, as makes them a very
“ fine Sallad in the Winter. But I have
“ tried, that when they are freshly ga-
“ thered, they will afford a Juice which
“ when newly ex-prefs’d (for in some Cases
“ ’twill soon enough degenerate) affords a
“ very deep and pleasant Blew. Now (to
“ draw this to our present Scope) by drop-
“ ping on this fresh Juice a little Spirit
“ of Salt (that being the Acid Spirit I
“ had then at Hand) it immediately
“ turn’d (as I predicted) into a Red.
“ And, if instead of the sour Spirit, I
“ mingled with it a little strong So-
“ lution of an Alcalizate Salt, it did pre-
“ sently

touching COLOURS. 5

“ sently disclose a lovely Green ; the same
“ changes being by those differing Sorts
“ of Saline Liquors, producible in this
“ Natural Juice, that we lately mention’d
“ to have happen’d to that factitious Mix-
“ ture, the Syrup of Violets. And I re-
“ member that finding this blew Liquor,
“ when freshly made to be capable of
“ serving in a Pen for an Ink of that Co-
“ lour, I attempted by moist’ning one
“ Part of a Piece of white Paper with
“ the Spirit of Salt I have been men-
“ tioning, and another with some Alca-
“ lizate, or Volatile Liquor, to draw a
“ Line on the leisurely dried Paper, that
“ should, even before the Ink was dry,
“ appear partly Blew, partly Red, and
“ partly Green; but though the latter
“ Part of the Experiment succeeded not
“ well (whether because Volatile Salts are
“ too Fugitive to be retain’d in the Paper,
“ and Alcalizate ones are too Unctuous,
“ or so apt to draw Moisture from the
“ Air, that they keep the Paper from dry-
“ ing well) yet the former Part succeeded
“ well enough; the Blew and Red being
“ conspicuous enough to afford a surprizing
“ Spectacle to those I acquaint not with
“ (what I willingly allow you to call) the
“ Trick.

There

6 *Practical Improvements*

There is but very little in these two Experiments, more than for Speculation ; for if a Magistery be made, either of the ex-pressed Juice of the Violets or Blue-bottles, or from the Tincture made by infusing the Flowers dried, the Colours, whether Green or Blue, will be no more permanent than the Tinctures ; for when used in Oil, they immediately turn red, and in Water colouring they will stand but a short Time, which may be supposed the Reason why Pigments of these two Colours made from Vegetables have been long out of Use, notwithstanding all the great Encomiums of several Authors on the Methods of making them after the Directions of *Neri* in his Art of Glass, of which Mr *Boyle* is likewise pleased to take some Notice at the Close of his 49th Experiment.

What I have now said, may also shew how likely it is to make a lasting Blue not inferior to Ultramarine, from the *Cyanus*, (mentioned in this XXIst Experiment) after a Manuscript of Mr *Boyle*, said to be obtain'd from the late Lord *Carlton* ; since by what I, as well as many more, have tried, it is not only improbable, but impossible to make that a durable Colour,
which

touching COLOURS. 7

which is naturally so subject to immediate Alteration on the Approach of an Acid, Alcalizate, or a sulphureous Salt. It is true, that the Colour made from the Cyanus is not quite so soon chang'd, as that from Violets, the latter having more Red intermixt with the Blue, than the other ; yet the Salts have the same Effect on the one as the other, which can by no means be prevented.

There are no Vegetable Substances (at least amongst the many that I have made Trials upon) from which Blue or Green Tinctures that are truly lasting can be produced : Even Indigo, which has such a very great Body, is durable no Way but in printed Calicoes and Linnen ; for, tho' it does last a long while in died Stuffs, it still goes off in Time ; and in Painting in Oil or Water it is so bad, that it is very rarely used. The lately invented Liquor also prepared thereof for staining the Linnen and Calicoe, if not immediately used, will fade and die away. And as for the Pigment called *Litmus*, the Blue Tincture thereof, which is sometimes made use of, is so changeable that the Air alone, without the Help of any Acid, will soon turn it Red. Nor is the Green Tincture made from the Violets, or Corn-Flowers, as
taught

8 *Practical Improvements*

taught in these two Experiments, more lasting than the Blue, the Greeness, how fine soever it does appear, presently changes into a dirty brown, without the Addition of any Salt, and not to a Red as the blue Colours are apt to do. The Red Colour also that is produced from them by an Acid, is but of little Value, the first Beauty of the Colour soon flying off. What is mentioned in the Annotation on the XXth Experiment concerning the *Lignum Nephriticum*, is of no Service in the Way of Colouring, it's only Use being to shew the various Effects the Rays of Light have to produce and change some Colours, as may be more amply seen in the Xth Experiment, pag. 199, &c. for the Tincture of that Wood is but of a dirty yellow Colour, and can be turned to no other Use than it is there design'd for, with Respect to Colours, and therefore I shall take no farther notice of it. In the Annotation on the XXIst Experiment, Mr Boyle says, ' That
' when he purposely dissolved blue Vitriol
' in fair Water, and thereby sufficiently
' imbued the Liquor with that Colour, a
' Lixivate Liquor, and a Urinous Salt
' being copiously poured upon distinct
' Parcels of it did each of them, though
' perhaps with some Difference, turn the
' Liquor

touching COLOURS. 9

“ Liquor not Green but of deep yellowish
“ Colour, almost like that of Yellow Oker,
“ which Colour the precipitated Corpuf-
“ cles retained, when they had leifurely
“ fubfided in the Bottom.” How that
judicious Gentleman came to affert this I
cannot conceive, unlefs by miftake he men-
tions Blue in the ftead of White Vi-
triol; for the latter does yield fuch a
Tincture and Precipitation; which laft,
when freed from the Salts, may be ufed
in the Painting way; but upon repeated
Trials I have found that the Blue Vitriol
treated in the Manner there mentio-
ned, makes both a Tincture and a Pow-
der of a pale Sea Green Colour.

As this Experiment relates chiefly to
Blue Tinctures, it may not be foreign to
the Subject to add here what ufe may be
made of the Vegetable, known in the Shops
by the name of *Litmus*, tho’ the Hon.
Mr *Boyle* does particularly mention his
Trials thereon in the 44th *Exp. page* 333
and 334.

What that moft ingenious Author fays
concerning the various Phænomena that ap-
peared upon the Additions of different Salts,
will in fome cafes ferve to our prefent pur-
pofe, fo far as thofe Salts are a means of
producing two if not three of the Tinc-

10 *Practical Improvements*

tures there set down; for that it is not at all practible to produce a Yellow from it that can be of any Use is, because the Yellow Appearance in that Experiment proceeds only from the thinness of the Colour, and is no more than a too much diluted Red, changed to a Yellow by the Rays of Light falling on the Surface of the Liquor, as may be also observed in such a diluted Purple Tincture of Cochineal, Logwood and such like, that otherwise have not the least Tint of Yellow: For by all the various Trials that I have made, I could never procure a Yellow Tincture like that of a Topaz from it.

The only Tinctures then, that I could make of it to be useful, were, a Blue, a Red inclining to Crimson, and sometimes a Purple, this last not always succeeding alike, the least Acidity turning it Red. The Method that will best Answer making a Blue Tincture, that will be least Subject to change Reddish, is, either to extract the Colour with a strong *Lixivium* of Pot-Ashes, or with Soap Lye: but great Care must be taken to let no Allum or any other Acid come to it; for any thing of that kind will not only destroy the Colour but precipitate it; and even

touching COLOURS. II

even in Spring Water it will not be so good a Blue.

To make a Red Tincture of *Litmus* is not so difficult, almost every thing, even the Air itself contributing thereto, as may be seen from the Cautions just now given about the Blue. To effect this you need only to infuse a sufficient quantity of *Litmus* in Allum Water, acidulated with a few Drops of *Aqua Fortis* or Spirits of Salt, and you will have a most beautiful Red Tincture, which being mixt with a little Gum Water, will serve for illuminating Maps and Prints, for Writing, or any other Purposes where Tinctures are useful.

Lastly, To make a Purple Tincture there is no other way than by extracting the Colour in limpid Water without the help of any Salt, and if it is to be used with Gum, no other will do, but Shreds of Leather, or Gum *Tragacanth* boil'd in Water; for Gum *Arabic*, or *Senegal* will help to make it Red. It must also be observed that to make a Red Tincture more *Litmus* is required in Proportion to Water, than for the other two Colours, the *Acid* not drawing the Colour out so well as a *Lixivate* Salt will do.

It will perhaps be here expected that I should shew the way of making Pow-

12 *Practical Improvements*

ders or Magisteries from the above Tinctures; but I found the making of them so difficult, and so much inferior to others that will be hereafter mentioned, that I thought it needless to speak of it; yet if any Body should be desirous to try what may be done by them, it will be necessary to observe that a Purple Powder cannot be made from the *Litmus*, and that Powders are made from the other two Tinctures by precipitating them with the contrary *Menstruums*; viz. the Blue with Allum Water, and the Red with Pot-ash Water, which produces a very odd Effect; for the Blue Tincture will yield a Reddish Powder, and the Red a Blueish one.

EXPERIMENT XXII.

“ OUR next Experiment will perhaps
“ seem to be of a contrary Nature
“ to the two former made upon Syrup
“ of Violets, and Juice of Blue Bottles.
“ For as in them by the Affusion of Oyl of
“ Tartar, a Blueish Liquor is made Green,
“ so

“ so in this by the sole Mixture of the
 “ same Oyl, a Greenish Liquor becomes
 “ Blue. The Hint of this Experiment
 “ was given us by the Practice of some
 “ *Italian Painters*, who being wont to
 “ counterfeit *Ultra marine Azure* as they
 “ call it, by grinding Verdigrease with
 “ *Sal Armoniac*, and some other Saline
 “ Ingredients, and letting them rot (as
 “ they imagine) for a good while together
 “ in a Dunghill, we supposed that the
 “ Change of Colour wrought in the Ver-
 “ digrease by this way of Preparation,
 “ must proceed from the Action of cer-
 “ tain Volatile and Alcalizate Salts, a-
 “ bounding in some of the mingled Con-
 “ cretes, and brought to make a farther
 “ Dissolution of the Copper abounding in
 “ the Verdigrease, and therefore conjectured
 “ that if both the Verdigrease and such
 “ Salts were dissolved in fair Water, the
 “ small parts of both, being therein more
 “ subdivided and set at Liberty, would
 “ have better Access to each other, and
 “ thereby incorporate much more sud-
 “ denly: And accordingly we found, that
 “ if upon a strong Solution of good
 “ *French Verdigrease* (for 'tis that we
 “ are wont to employ as the best) you
 “ pour a just quantity of Oyl of Tartar,
 “ and

14 *Practical Improvements*

“ and shake them well together, you
“ shall immediately see a notable Change
“ of Colour, and the Mixture will grow
“ thick and not transparent, but if you
“ stay a while, till the grosser part be
“ precipitated to, and settled in the Bottom,
“ you may obtain a clear Liquor of a very
“ lovely Colour, and exceedingly delight-
“ ful to the Eye. But, you must have
“ a care to drop in a competent quan-
“ tity of Oil of Tartar, for else the Co-
“ lour will not be so deep and rich; and
“ if instead of this Oil you employ a
“ clear *Lixivium* of Pot-ashes, you may
“ have an Azure somewhat lighter or
“ Paler than, and therefore differing from,
“ the former. And if instead of either
“ of these Liquors, you make use of Spi-
“ rit of Urine, or of Hartshorn, you may
“ according to the Quantity and Quality
“ of the Spirit you pour in, obtain a far-
“ ther Variety (tho’ scarce considerable)
“ of cæruleous Liquors: And yet lately by
“ the help of this Urinous Spirit we made
“ a Blue Liquor, which not a few in-
“ genious Persons, and among them, some
“ whose Profession makes them conver-
“ sant in Colours, have looked upon with
“ some wonder. But these Azure co-
“ loured Liquors shou’d be free from
“ the

touching COLOURS. 15

“ the subsiding Matter, which the Salts
“ of Tartar, or Urine precipitate out of
“ them, rather by being decanted, than
“ by Filtration: For by the latter of
“ these Ways, we have sometimes found
“ the Colour of them very much im-
“ paired, and little superior to that of the
“ grosser Substance, that is left in the
“ Filtre.

Altho' the Subject of this Experiment was not much for my Purpose, I was nevertheless willing to make it as useful as I could to others, and therefore was induced to make the following Remarks thereon. As for the Hint the Author gives of the Practice of some *Italian* Painters who counterfeit the Colour of the *Ultramarine*, by grinding Verdigrease with *Sal Armoniac*, &c. and burying it so for some time in a Dunghill; I cannot see how that could Answer the Design, because the strong Acidity that is contained in the Verdigrease is so corrosive that it not only destroys all the Colours it comes near or is mixt with; but it is also impossible by any Means, either by Volatile or Alcalizate Salts, to prevent it's turning Green, as well when used in Oil, as in Water, the Air itself soon taking off all Resemblance of Blue. Nevertheless,

16 *Practical Improvements*

vertheless, I had a mind to try if I could not find out some Means to deprive the Verdigrease from it's corroding Quality, or at least so to blunt the Points of the Salts, as to render it more useful and less offensive than it is at present: For this purpose I chose rather to make use of distilled, than of crude Verdigrease, the latter yielding so little Colour in proportion to it's Bulk, whereas the other entirely dissolves almost in all *Menstruums*, and in some so well as to need no Filtration.

After having made as many Trials as I thought worth while, there were but two out of a great Number, that to me seemed to deserve Notice; of both which I will set down the Processes and Use.

First I took an Ounce of the distilled Verdigrease, and having reduced it to a very fine Powder, dissolved it in four Ounces of Spirits of Hartshorn, which produced a very beautiful deep caruleous Tincture: But tho' this Colour did appear of such a rich Blue hue, that it rather inclined to a Purple than a Green, yet being put into a Viol and held between the Eye and the Light, the Surface discovered a faint Resemblance of a Blue Green, and
being

touching COLOURS. 17

being wrote with, or spread on white Paper there was, as soon as dry, a manifest strong Appearance of a Sea Green ; which therefore I judged to be serviceable to Gentlemen that delighted in illuminating Perspective Views, Maps, &c.

But to make the use of this Tincture as extensive as I could, was desirous to try what Effect it would have to precipitate the Verdigrease. To do this I proceeded according to the usual Method of precipitating Acids with Alcalys as before mentioned ; but I found myself deceived by the Event ; for the Verdigrease, tho' an Acid, would not be struck down with a Lixivate Alcaleous Liquor or Salt ; wherefore I was obliged to have recourse to another Method, and took some of my Allum Water (which is made by boiling an uncertain quantity of Allum in Water till all is dissolved, and when quite cold, decanted from the Allum that subsides) and added it to an equal Proportion of the Tincture in a large Viol, when after a little Effervescence I had the Pleasure to see a fine Blue Green Powder settle to the Bottom, which, being washed well with warm Water, till the Water came off as sweet as it was put on, I spread on clean white Tiles

D

to

18 *Practical Improvements*

to dry, in a Place free from Dust. But if it happens that the Colour does not all precipitate at first, then the Tinctured Liquor must be poured off in another Viol, and precipitated with fresh Allum Water, till all the Colour is taken out of the *Menstruum*; tho' this last Powder does not come off so deep as the first, because of the additional quantity of Allum. By this method I perceived however, with great Satisfaction, that notwithstanding that the Precipitation was performed with an Acid, the Powder was almost entirely free from those corroding noxious Qualities, so pernicious and offensive in the Verdigrease, which I imputed to it's being dissolved in the Alcalizate Spirit. This Powder will readily incorporate with Gum Water and Oyl, and makes a very lively pleasant Colour in both ways of Painting. I will freely acknowledge that it has not so great a Body as the Verdigrease, nor will bear so much white Lead as that, but then, on the other Hand, it is not so nauceous, and covers better without White then the other does.

The second way that I found best to free Verdigrease from it's bad Qualities, and to make it more durable, even in
the

touching COLOURS. 19

the Air, (on both which Accounts most People are deterred from using it) was by dissolving the fine Powder in Allum Water, and precipitating it with a sufficient quantity of Oyl of Tartar *per deliquium*, or a Lixivium of Pot-ashes, by either of which a Green Powder is obtained, which being washed and dried as above, became equally useful to the first.

From these two Processes it will be easily conceived how unlikely it is to bring Verdigrease to the Hue of *Ultra marine*; for if by dissolving it in the most active Alcalizate Spirit, or præcipitating it with the strongest lixivial Salt, nothing better than a Sea Green Powder can be produced, how can it with Reason be supposed that Grinding it with *Sal Armoniac* (which is an Acid) tho' mixt with Lime to make the Salt more volatile and active, and burying it in a Dunghill, should so much alter the Colour as to make it a permanent Blue; and even to equal *Ultra marine*? For it will, I believe, be allowed by all who are acquainted with the Nature of Volatiles, that let the Change that is occasioned thereby in Colours, be what it will, as soon as the Volatile Particles are gone off, the
Original

20 *Practical Improvements*

Original Matter differs little, if at all, from it's pristine State, so that if any lasting Change can be procured, it must (in my humble Opinion) be done by a fixt Alcalizate Salt; and yet I have found by Experience that Verdigrease ground with Lime, which I think is as little liable to lose it's Strength as any Alcaly whatsoever, tho' as well incorporated as possible, will, when mixt up with Oyl for Painting, soon acquire a perfect Green Tint, tho' before Mixture a beautiful Blue.

I have continued longer than I should on this Subject, only to shew that the greatest Men are not entirely free from the Impositions of artful, ill-designing Men, who can, for the Sake of Lucre, occasionally assume the Appearance of Honesty and Ingenuity to deceive Mankind, without Distinction or fear of being detected.

Yet before I leave treating on this Drug it may not be altogether unacceptable if I add a Process communicated to me some Years ago by a Friend of mine, and which I have since often made use off with great Satisfaction. The Recipe is as follows.

Take of Distilled Verdigrease one Pound;
Rhenish Tartar four Ounces; let both
be reduced to a very fine Powder and
put

touching COLOURS. 21

put into two Quarts of Water, and a Pint of the best Vinegar; when it has stood to digest three Days and three Nights, and the Vessel shaken often in that Time, filter the Liquor thro' a Paper and boil it over a gentle Fire in the open Air, to the quantity of a Pint; but great Care must be taken that it boils not too hot, lest the Colour be burnt and spoiled. This is an excellent Green Tincture for illuminating Maps, Prints, &c. and may be used as Ink: It will likewise serve before it is boiled, for staining of Ivory Green, by laying the Ivory therein for some Days, till it acquires a deep Colour. The Smell of the Verdigrease may be taken off by putting the stained Ivory a Day or two in clear Urine.

N. B. *This Method of Staining has been approved of by several curious Persons, as the best that has of late Years been practised.*

EXPERIMENT

22 *Practical Improvements*

EXPERIMENT XXIV.

“ **I**T may (*Pyrophilus*) somewhat serve
“ to illustrate, not only the Doctrine
“ of Pigments, and of Colours, but divers
“ other Parts of corpuscular Philosophy,
“ as that explicates Odours and many other
“ things, not as the Schools by airy Qua-
“ lities, but by real though extremely mi-
“ nute Bodies; to examine how much of
“ the colourless Liquor a very small Par-
“ cel of a Pigment may imbue with a
“ discernable Colour: And though there
“ be scarce any thing of Preciseness to be
“ expected from such Tryals, yet I pre-
“ sumed, that, at least, I should be able
“ to shew a much farther Subdivision of
“ the Parts of Matter into visible Parti-
“ cles, than I have hitherto found taken
“ notice of, and than most Men would
“ imagine; no Body, that I know of, ha-
“ ving yet attempted to reduce this Matter
“ to any Measure. The Bodies the most
“ promising

touching COLOURS. 23

“ promising for such a Purpose, might
“ seem to be the Metals, especially Gold,
“ because of the Minuteness of it's Parts,
“ which might be argu'd from the incom-
“ parable Closeness of it's Texture. But
“ though we tried a Solution of Gold,
“ made in *Aqua Regia* first, and then
“ in fair Water, yet in Regard we were
“ to determine the Pigment we employed
“ not by Bulk but Weight; and because
“ also, that the Yellow Colour of the
“ Gold is but a faint one in comparison
“ of the deep Colour of Cochineal, we
“ rather chose this to make our Tryals
“ with. But among divers of these it will
“ suffice to set down one, which was
“ carefully made in Vessels conveniently
“ shap'd (and that in the Presence of a
“ Witness or Assistant) the Sum where-
“ of I find among my *Adversaria*, regi-
“ stered in the following Words. To which
“ I shall only premise, to lessen the Won-
“ der of so strange a Diffusion of the Pig-
“ ment, that Cochineal will be better dis-
“ solved, and have it's Colour far more
“ heightned by Spirit of Urine, than (I
“ say not by common Water itself, but)
“ by rectified Spirit of Wine itself. The
“ Note I spoke of is this; [One Grain of
“ Cochineal dissolved in a pretty Quantity
“ of

24 *Practical Improvements*

“ of Spirit of Urine, and then dissolved
“ farther by degrees in fair Water, impart-
“ ed a discernable, tho’ but a very faint
“ Colour, to about six Glasfuls of Water,
“ each of them, containing about Forty
“ three Ounces and a half, which amounts
“ to above a hundred twenty five times
“ it’s own Weight.]

N. B. *A few other Tryals on Cochineal are set down in the 32d and 44th Experiments; but as they were almost the same with these, I thought it needless to transcribe them.*

Mr Boyle has treated of Cochineal not only here, but promiscuously with other Things in several Experiments, viz. 32d and 44th. But as his *Tentamina* are often occasional, and sometimes only in order to shew the great variety of Phænomina and Changes in the Juices and Tinctures of Vegetables, and other Drugs, by Alcalizate or Acid Salts, I thought it would best agree with my Design, to render those useful Hints and speculative Tryals practicable, to bring all that to me appeared likely to be serviceable under one Article, that the Reader might not have the Trouble of turning over many Leaves for what could be brought into a narrower

touching COLOURS. 25

rower Compass ; I shall therefore set down the Improvements upon the several Experiments in the same Order as I have from Time to Time made them without Regard to the Course of the Experiments themselves.

This little Insect, called, *Cochineal*, abounds with so much Colour, that (as the learned Author truly observes) there are but few Things in the Animal, Vegetable or Mineral Kingdoms, whose Tincture can be so extensively diffused ; but then it is as certain, that there is scarce any Tincture more difficultly made permanent, than this of *Cochineal*. Spirit of Urine, or any other Alcalizate Spirit, or Lixivial Salt, does indeed most powerfully draw out and exalt the Colour, but it does at the same Time act so violently, that in a very short Time the Colour will from a very deep *Crimson* be thereby changed into a dirty *Brown*, inclining to *Yellow* ; tho' Mr *Boyle* in his thirty-second Experiment assures us, that by all his Tryals he could not make the Tincture of *Cochineal* incline to a *Yellow*.

This extraordinary Operation of the Urinous Spirits, &c. plainly shewed me that they were not proper to be employed to make a Tincture of *Cochineal*, unless

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for

26 *Practical Improvements*

for Curiosity's Sake, and accordingly put me upon trying in what Kind of *Menstruum* the Tincture could be made most durable. I found that Spirits of Wine produced an exquisite bright Colour, enclining pretty much to the Scarlet, particularly when the Spirit had first been acidulated with a few Drops of single *Aqua Fortis*; but when I tried to write or draw Lines therewith on Paper, I perceived that by it's spreading or flowing it would be unfit for such a Use, the Letters and Lines appearing very rough and ragged, which could not be prevented by Gum nor any other Method; so that the only Use I found it would be proper for, was to make a transparent Spirit Varnish, where it makes a very beautiful Colour. Nevertheless the fine Colour of the Tincture tempted me to try to make a Scarlet Lake thereof, by a Præcipitation either with an Acid or an Alcaly; and accordingly to some of the Tincture, I added some *Lixivium* of Potashes, but this had no other Effect than to incorporate therewith, and turn the Colour on the Purple Hue: I then added to some more of the same Tincture a Quantity of Allum Water, expecting thereby to see the Colour struck down, but instead of that, the Allum was præcipitated by

touching COLOURS. 27

by the Spirit alone, in a White Powder, and the Colour left suspended in the Liquor. These Tryals convinced me that a Tincture made with Spirit of Wine was no farther useful than before-mentioned, and obliged me to think of other Methods.

After several Experiments (all which it will be needless to take notice of, as they varied only in a few inconsiderable Particulars) two of them only succeeded according to my Wish, the Processes whereof are as follows :

The most lasting Tincture that can be made to be useful is thus performed.

Boil two Ounces of Rhenish (or for want of that half an Ounce of Cream of) Tartar powdered in a Pint of *Thames* Water about an Hour, after which, when it is cold and settled, decant off the Water, and mix with it an equal Quantity of Alum Water, adding ten or twelve Drops of single *Aqua Fortis*. Into this Mixture put two Drams of the best Cochineal powdered, let it infuse near five Hours by a gentle Heat, or in the warm Sun; and after that, first strain it through a linnen Cloth, pressing all the Liquor from the *Fæces*, and then filter it thro' Paper, when you will have a fine deep Scarlet Tincture,

28 *Practical Improvements*

which may be mixt with Gum Water, or a Decoction of Shreds of Leather will serve for Writing, and Illuminating, and may be, by the Addition of a little Rose-Water, preserved a long Time without growing Mothery and from Decay, being kept close stopped.

Another rich Tincture can also be made by boiling or infusing the Cochineal in Allum Water alone, which will be as durable as the former, and may do very well for some Intentions; but as it is nothing of a Scarlet, but a bright Crimson Colour, I thought it sufficient slightly to mention it, and chiefly as the next following Process for making a good Lake is for the most Part upon the same Basis.

All the Methods that I have read for making a red Lake are either fallacious or good for little : For as they are principally made from Cochineal, or rather Shreds of Scarlet Cloth or Stuffs, boiled in a *Lixivium* of Pot-Ashes, and precipitated with Allum Water, the Lake can never be but of a Purplish Hue, and that not quite so beautiful as it should be, because the Activity of Alcalizate Salt does somewhat impair the Colour of the Cochineal before the Præcipation is performed : And that made from the Shreds is so weak, unless

ex-

touching COLOURS. 29

extracted with exceeding strong *Lixivium*, that the Lake cant have half Body enough to satisfy the Limners.

Therefore after repeated Tryals I thought the two subsequent Methods were not unworthy to be recommended as preferable to those above taken Notice of.

The first is made by infusing a Dram of fine powdered Cochineal into a Pint of Allum Water, placing it near a gentle Fire to boil softly about four or five Hours; then let it grow cold and settle, after which pour it off from the subsiding *Fæces* into a clean Vessel: On the *Fæces* I put another half pint of Allum Water and boyled as before about half an Hour to draw out all the Colour of the Cochineal: This I strained thro' a Cloth, pressing all the Tincture out of the Powder, and added it to the other Tincture, and filtered altogether thro' a Paper, into a clean Viol: Then I made a Solution of an Ounce of Salt of Tartar in a Quart of Water, and after having filtered that too, added it to the Tincture of Cochineal in a large, clean, glazed Pan or a Glass, that the Ebullition may not go over the Edge of the Vessel. After the Effervescence is over the Red Powder will subside, from which the Liquor was gently poured off; and if that still retained a deepish Colour, some more of the
Solution

30 *Practical Improvements*

Solution of Salt of Tartar was put thereto, that all the Colour might be præcipitated, and the almost colourless Water poured off; after that a large Quantity of distilled or other clear Water was put on the Powder, to be washed therewith till it came off as insipid as it was poured on, observing always to let the Colour settle well before the Water was decanted from it; This done, I dry'd the Powder by spreading it on Tiles, as before mentioned in making the Green, and I had the Satisfaction of obtaining a fine Lake, nothing inferior to the *Florentine*, which might have been made up into little Grains in the manner Lakes are met with in the Shops. Tho' I would rather advise the Maker to keep this, as all other Colours in the Powder, because, to make them up in these little Grains, they must be ground up with Starch or other Matter to make them stick together, whereby the Body of the Colours is not only weakned, but likewise make them apt to grow fat and unwilling to dry, as is experienced by those that use them in Oyl. But as I perceived that this, like the *Florentine* Lake, inclined a little too much towards the Purple, against which Quality the Limners mightily exclaim, I employed my Thoughts to find out one that

touching COLOURS. 31

that should not be liable to that Objection, and for that Purpose made Tryal on many of the Vegetables that yield Red Tinctures, many of these I found to be, either not at all durable in Air, or Subject to change on the approach of Saline and Sulphureous Qualities, or naturally very nearly border on the Purple. Of all the Drugs I tried, Kermes Berries and Madder best answer'd my Desires ; but as the first are scarce and dear, I confined myself to the latter, which is cheaper and easier to be had. Of this I made a Tincture by infusing two Ounces of the best Crap, in a Pint of Allum Water, near a gentle Fire about the Space of two Hours, and then, after having let it settle about Twenty Four Hours, I filter'd it thro' a Paper. Of this Tincture alone a Scarlet Lake was made by præcipitating the Tincture with a *Lixivium* of Salt of Tartar, and afterwards washed and dried as before directed. But as I did not think this Lake from the Madder, *per Se*, beautiful enough, I mixed the Tincture of Madder with about a fourth of it's Quantity of the abovementioned Tincture of Cochineal, and then præcipitated it as before, which produced a much finer Lake. Yet this must be observed that as all Madder does not give an equal Quantity of Colour.

32 *Practical Improvements*

Colour, it will be necessary to make a few Tryals, before you proceed to make the Lake. The Kermes Berries do likewise make a fine Scarlet Tincture by boiling an Ounce of them in about a Pint of Roch-Allum Water, adding a few Drops of Oyl of Sulphur.

N. B. *By putting a little Sal Martis, or a piece of Steel into the Tincture of Cochineal, it will be changed into a lovely Purple; which is not only directly contrary to the Operation of all other Acid, or Metallic Salts, whereby the Tincture of Cochineal is usually turned towards a Yellow; but is even more than can be effected by any Alcaly that I know of.*

EXPE-

EXPERIMENT XXVI.

“ **A**ND (first) I thought fit to try the
 “ Operation of Acid Salts upon
 “ Vegetable Substances, that are already
 “ and by their own Nature Red. And
 “ accordingly I made Tryal upon Syrrup of
 “ Clove July-flowers, the clear exprefs’d
 “ Juice of the succulent Berries of *Spina*
 “ *Cervina*, or Buckthorn, (which I had
 “ long kept by me for the sake of it’s
 “ deep Colour) upon Red Roses, Infusion
 “ of Brazil, and divers other Vegetable
 “ Substances, on some of which crush’d (as
 “ is often mentioned) upon White Paper,
 “ which is also to be understood in most
 “ of these Experiments, if no Circum-
 “ stance of them argue otherwise; Spirit
 “ of Salt either made no considerable
 “ Change, or altered the Colour but from
 “ darker to a lighter Red. How it will
 “ succeed in many other Vegetable Juices,
 “ and Infusions of the same Colour I have
 “ F “ at

34 *Practical Improvements.*

“ at present so few at hand, that I must
“ leave you to find it out your self. But
“ as for the Operation of other sorts of
“ Salts, upon these Red Substances, I found
“ it not very uniform, some Red or
“ Reddish Infusions, as of Roses, be-
“ ing turned thereby into a dirty Colour,
“ but yet inclining to Green. Nor was
“ the Syrrup of Clove July-flowers tur-
“ ned by the Solution of Pot-ashes to a
“ much better Colour. Another Sort of
“ Red Infusions was by an Alcaly not
“ turned into a Green, but advanced in-
“ to a Crimson, as I shall have oc-
“ casion to note e're long. But there were
“ other Sorts, as particularly the lovely
“ coloured Juice of Buckthorn Berries,
“ that readily pass'd into a lovely Green.

EXPERIMENT. XXIX.

“ **I**T may be of some Use towards
“ the Discovery of the Nature of
“ these Changes, which the Alimental
“ Juice receives in some Vegetables, ac-
“ cording to the differing Degrees of their
“ Maturity, and according to the differing
“ Kinds

touching COLOURS. 35

“ Kinds of Plants of the same Denomi-
“ nation, to observe what Operation Acid,
“ Urinous, and Alcalizate Salts will have
“ upon the Juices of the several Sorts of
“ the Vegetable Substances I have been
“ mentioning. To declare my Meaning
“ by an Example, I took from the same
“ Cluster, one Blackberry full ripe, and
“ another that had not yet gone be-
“ yond a Redness, and rubbing a Piece of
“ White Paper with the former, I observ’d
“ that the Juice adhering to it was of a
“ dark Reddish Colour, full of little Black
“ Specks, and that this Juice by a Drop
“ of a strong *Lixivium* was immediately
“ turn’d into a Greenish Colour deep
“ enough, by as much Urinous Spirit into
“ a Colour much of Kin to the former,
“ though somewhat differing, and fainter;
“ and by a Drop of Spirit of Salt into a
“ fine and lightsome Red: whereas the Red
“ Berry being in like manner rubb’d upon
“ Paper, left on it a Red Colour, which
“ was very little alter’d by the Acid Spirit
“ newly nam’d, and by the Urinous and
“ Lixivate Salts receiv’d Changes of Co-
“ lours differing from those that had been
“ just before produced in the dark Juice of
“ the ripe Blackberry. I remember also,
“ that though the Infusion of Damask

36 *Practical Improvements.*

“ Roses would as well, though not so much,
“ as that of Red, be heightened by *Acid*
“ Spirits to an intense degree of Redness,
“ and by *Lixivate* Salts be brought to a
“ darkish Green; yet having for Tryal sake
“ taken a Rose, whose Leaves, which
“ were large and numerous, like those of
“ a Province Rose, were a perfectly Yel-
“ low, though in a Solution of Salt of
“ Tartar, they afforded a Green Blewish
“ Tincture, yet I did not by an Acid
“ Liquor obtain a Red one; all that the
“ Saline Spirit I employ’d perform’d, being
“ (if I much mis-remember not) to di-
“ lute somewhat the Yellowness of the
“ Leaves. I would also have tried the
“ Tincture of Yellow Violets, but could
“ procure none. And if I were in those
“ Islands of *Banda*, which are made Fa-
“ mous as well as Rich, by being the al-
“ most only Places, where Cloves will
“ prosper, I shou’d think it worth my
“ Curiosity to try, what Operation the
“ three different Kinds of Salts, I have so
“ often mentioned, would have upon the
“ Juice of this Spice, (express’d at the se-
“ veral Seasons of it) as it grows upon
“ the Tree. Since good Authors inform
“ us (of what is remarkable) that these,
“ whether Fruits or Rudiments of Fruits,
“ are

touching COLOURS. 37

“ are at first white, afterward Green, and
“ then Reddish before they be beaten off
“ the Tree, after which being dry’d be-
“ fore they are put up, they grow Blackish
“ as we see them. And one of the re-
“ centest Herbarists informs us, that the
“ Flower grows upon the Top of the
“ Clove itself, consisting of four small
“ Leaves, like a Cherry-Blossom, but of
“ an excellent Blew. But to return to our
“ own Observations, I shall add, that I
“ the rather chuse to mention to you an
“ Example drawn from Roses, because
“ that though I am apt to think, as I
“ elsewhere advertise, that something may
“ be guess’d at about some of the Quali-
“ ties of the Juices of Vegetables, by the
“ Resemblance or Disparity that we meet
“ with in the Changes made of their Co-
“ lours, by the Operation of the same
“ Kinds of Salts ; yet that those Conjec-
“ tures should be very warily made, may
“ appear among other things, by the In-
“ stance I have chosen to give in Roses.
“ For (though as I formerly told you) the
“ dry’d Leaves both of the Damask and
“ of Red ones, give a Red Tincture to
“ Water sharpen’d with Acid Salts, yet
“ the one Sort of Leaves is known to
“ have a purgative Faculty, and the other
“ are

38 *Practical Improvements*

“ are often, and divers Ways employ’d
“ for Binding.

“ And I also chuse to subjoin this
“ twenty ninth Experiment to those that
“ precede it, about the Change of the
“ Colours of Vegetables by Salts, for these
“ two Reasons : The first, that you may
“ not easily entertain Suspensions, if in the
“ Tryals of an Experiment of some of the
“ Kinds formerly mention’d, you should
“ meet with an Event somewhat differing
“ from what my Relations may have
“ made you expect. And the second, that
“ you may hereby be invited to discern,
“ that it may not be amiss to take notice
“ of the particular Seasons wherein you
“ gather the Vegetables which in nicer Ex-
“ periments you make use of. For, if I
“ were not hindred both by haste and
“ some justifiable Considerations, I could
“ perhaps add considerable Instances to
“ those lately deliver’d, for the making
“ out of this Observation ; but for certain
“ Reasons I shall at present substitute a
“ remarkable Passage to be met with in
“ that Laborious Herbarist Mr *Parkinson*,
“ where treating of the Vertues of the al-
“ ready divers times mention’d Buckthorn
“ Berries, he subjoins the following Ac-
“ count of several Pigments that are made
“ of

touching COLOURS. 39

“ of them, not only according to the fe-
“ veral Ways of handling them, but ac-
“ cording to the different Seasons of Ma-
“ turity, at which they are gather'd :
“ And I remember that I tried, with a
“ Success that pleas'd me well enough, to
“ make such a Kind of Pigment, as Pain-
“ ters usually call Sap-Green, by a way not
“ unlike that, deliver'd here by our Au-
“ thor, but I cannot find any thing re-
“ lating to that Matter among my loose
“ Papers, And my Tryals were made so
“ many Years ago, that I dare not trust
“ my Memory for Circumstances, but I
“ will rather tell you that in a noted Co-
“ lour Shop, I brought them by Questions
“ to confess to me, that they made their
“ Sap-Green much after the Ways by our
“ Botanist here mention'd. And on this
“ occasion I shall add an Observation
“ which, though it does not strictly belong
“ to this Place, may well enough be men-
“ tioned here ; namely, that I find by an
“ Account given us by the Learned *Clu-*
“ *sus* of *Alaternus*, that even the grosser
“ Parts of the same Plant are some of
“ them one Colour, and some another ;
“ For speaking of that Plant ; he tells
“ us, that the *Portugals* use the Bark to
“ dye their Nets into a Red Colour, and
“ with

40 *Practical Improvements*

“ with the Chips of the Wood, which
“ are Whitish, they dye a Blackish Blew.”

The Tryals that come next to be taken notice of are but a Part of these Experiments (the rest being of no use to my present Design) yet I hope what I have set down relating thereto will be serviceable. In my Search for a good Green I tried, amongst other Things, what this Juice of Buckthorn Berries would do ; but I soon perceived that not much could be effected therewith, for when I had inspissated it to a thick Extract with the greatest Caution to prevent it's burning, it yielded but a very bad dirty Green : Besides that, the Tincture of the Juice is so faint that it required a great deal of Trouble and Expence to inspissate a quantity of Juice sufficient to make proper Tryals upon ; both which, as well as the Change that the Acids made in the Colour, discouraged me from attempting any thing farther with it. I had, however, recourse to a Pigment said to be made of this Juice, called in the Shops, by the Name of Sap-Green, which was not only ready prepared to my hand, but promised something considerable to be performed by it. There are two Sorts of this Sap-Green sold ; the one
English,

touching COLOURS. 41

English, the other *French*. The first does not so readily dissolve in Water as the latter, and inclines much more to the Yellow: Therefore I chose to make use of the last. To make a Green Tincture of any degree of Strength, far exceeding the Juice of the Buckthorn, there needs no more trouble than to dissolve it in fair cold Water, in which it will serve for illuminating Maps, Prints, &c. without the Addition of any Gum: And if a little Vinegar is put into the Water it will turn it more Green; but it must be observed that it will require to be made fresh as often as the Colour appears to decay, or yellowish. To make this Tincture of a more pleasant Green, some fine Powder of distilled Verdigrease may be added at Pleasure; only giving it a proper Time to dissolve and incorporate therewith, whereby the Colour may be varied, more Yellow or Green, and deeper or paler as Occasion shall make it necessary. I must also put you in Mind that with or without the Verdigrease, the Tincture should be filtered thro' Paper before it is used.

The second Use that is to be made of this Sap-Green, is to procure from it a fine Lemon Yellow Tincture, that will answer the End of the Green gathered Buckthorn Berries, which Mr *Parkinson*

42 *Practical Improvements*

says are used for that Purpose. To do this, take twenty four Grains of the Sap, dissolve it, (finely powdered) with an equal Quantity of Salt of Tartar in four Ounces of warm Water, and in three or four Hours Time you will have a beautiful Colour, which must likewise be filtered and will be fit for any of the above-mentioned Uses.

This last Process should more properly have been inserted where I treat of the Experiments relating to Yellow Pigments, but as it was on the Basis of the Sap-Green, I thought it would not come in amiss here, it being the Subject of these Experiments. There may also be made of this Drug, a fine Red Tincture, that will serve instead of some of the Reds before spoken of, and this is done only by dissolving it in Water, acidulated with a few Drops of single *Aqua Fortis*; but of this Red Tincture no Red Powder or Lake can be made, for upon Præcipation, which must be performed by an Alcaly, the Powder will be of a Greenish Yellow Colour: Nor can there be a Green Powder made of it, because it can be dissolved in no Acid or Saline *Menstruum*, except Vinegar, to make a Green Tincture, and then whatever it is præcipated with will turn it a Yellow. I should now proceed to the 49th Experiment; but I will first say something relating

lating to Mr *Boyle's* Quotation from *Parkinson* concerning the Buckthorn Berries, and Sap-Green, in the latter Part of the 29th Experiment.

Mr *Parkinson* says, ' That of these Berries
' are made three several Sorts of Colours as
' they shall be gathered, that is, being gathered while they are Green, and kept
' dry, they are called Sap-Berries, which
' being steep'd into some Allum Water, or
' fresh bruised into some Allum Water, they
' give a reasonable, fair, Yellow Colour,
' which Painters Use for their Work, and
' Book-binders to colour the Edges of Books,
' and Leather-dressers to colour Leather,
' as they use also to make a Green Colour,
' call'd Sap-Green, taken from the Berries
' when they are Black, being bruised and
' put into a Brass or Copper Kettle or Pan,
' and there suffered to abide three or four
' Days, or a little heated upon the Fire,
' and some beaten Allum put into them,
' and afterwards press'd forth, the Juice or
' Liquor is usually put in great Bladders tied
' with strong Thread at the head and hung
' up until it be dry ; which is dissolved in
' Water or Wine, or Sack, which last he
' affirms is the best to preserve the Colour
' from starving or decaying, and make it
' hold fresh the longer. The Third Colour
' is a Purplish, made from the Berries suffered to grow upon the Bushes till the
G 2 ' middle

44 *Practical Improvements*

‘ middle or end of *November*, when they
‘ are ready to drop from the *Trees*.’

The Truth of this Account I can’t contradict, having never had Opportunity nor Leisure to try the Berries of these different Degrees of Maturity ; but will beg leave to observe on the first Part thereof, that the Yellow Colour used by Painters (called in the Shops *Dutch Pink*) and the Tincture wherewith, I think, Bookbinders generally colour their Leaves, and Leather-dressers their Leather, is made of *French Berries of Avignon*, that grow on the Box-Thorn, and are called Sap-Berries as may be seen in *Pomet’s History of Drugs*, *Pag. 21.* which Berries differ in all Respects from those of the *Spina Cervina*, or Buckthorn.

The second Part of the Account concerning the Sap-Green is confirmed as well by Mr *Boyle*, in the same 29th Experiment, as by *Pomet’s History of Drugs*, *B. ix. Pag. 223.* in the Article of *Rocou*. But nevertheless, I think there is some reason to doubt whether all, or the best, Sap-Green is made of the Buckthorn Berries ; for besides what I have before hinted about inspissating the Juice, I could never find that Allum would change the Tincture of Sap-Green Red, as Mr *Boyle* asserts of this Juice, but to a bright Yellow, as appears
from

from the forementioned fine Lemon coloured Tincture. Possibly the *English* Sap is made of the Buckthorn Juice, according to Mr *Parkinson's* Relation, because I always found that to have less Body, more Yellow, and harder to dissolve than the *French*. To this might be added, that if the Sap-Green is made of the Juice of Buckthorn Berries, it is something of a Wonder it has not yet been introduced into Physic as a Cathartic (having been known long enough) instead of the Juice, which can be had but once a Year, and requires so much Trouble and Room to preserve it all the Year, when the Sap may be had always, and is dissolved in a few Minutes, if the Quantity for a Dose is once fixt. Wherefore I should rather imagine the Sap-Green to be made from young Leeks, (as the *Greek* Name *Prasison*, and *Latin* *Prasinus* or *Porraceus* imports) or from some other Plant that abounds with a more deep tintured Green Juice, than that of the Buckthorn Berries. But as this is my private Notion, which I have not had Experience enough to be assured of, I will submit to the Authority of these two Gentlemen that have obliged the World with such excellent Works. What is contain'd in the third Part I know nothing of, there being at present

46 *Practical Improvements*

present no purple Colour to be met with in the Shops, besides Turnsole, which, according to Mr *Parkinson's* Account, quoted by Mr *Boyle* in his 36th Experiment of this Essay, is made of another Berry; so shall leave this Subject, and go on to my Tryals on Experiment 49.

EXPERIMENT. XLIX.

“ **M** EETING the other Day in
“ an *Italian* Book, that treats of
“ other Matters, with a Way of preparing
“ what the Author calls a *Lacca* of Vege-
“ tables, by which the *Italians*, mean a
“ Kind of Extract fit for Painting, like
“ that rich *Lacca* in *English*, commonly
“ called *Lake*, which is employ'd by
“ Painters as a glorious Red : And finding
“ the Experiment not to be inconsiderable
“ and very defectively set down, it will
“ not be amiss to acquaint you with what
“ some Tryals have informed us, in refe-
“ rence to this Experiment ; which both
“ by our *Italian* Authors and by divers of
“ his Countrymen, is look'd upon as no
“ trifling Secret.

“ Take then the Root call'd in *Latin*
“ *Curcuma*, and in *English* Turmerick,
“ which

touching COLOURS. 47

“ (which I made use of, because it was
“ then at hand, and is among Vegetables
“ fit for that Purpose one the most ea-
“ siest to be had) and when it is beaten,
“ put what Quantity of it you please into
“ fair Water, adding to every Pound of
“ Water about a Spoonfull or better, of
“ as strong a *Lixivium* or Solution of
“ Pot-ashes as you can well make, clari-
“ fying it by Filtration before you put it
“ to the decocting Water. Let these
“ Things boil or rather simmer over a soft
“ Fire, in a clean glaz'd Earthen Vessel,
“ till you find by the Immersion of a Sheet
“ of White Paper (or by some other way
“ of Tryal) that the Liquor is sufficiently
“ impregnated with the Golden Tincture
“ of the Turmerick; then take the De-
“ coction off the Fire, and filter or strain
“ it, that it may be clean, and leisurely
“ dropping into a strong Solution of Roch
“ Allum, you shall find the Decoction, as it
“ were curdled, and the tinted Part of it
“ either to emerge, to subside, or to swim up
“ and down like little Yellow Flakes; and if
“ you pour the Mixture into a Funnel lin'd
“ with Cap Paper, the Liquor that filtred
“ formerly so Yellow, will now pass clean
“ through the Filter, leaving it's tinted,
“ and as it were curdled Part in the Filtre,
“ upon which fair Water must be so often
“ pour'd

48 *Practical Improvements*

“ pour’d, till you have dulcified the Mat-
“ ter therein contain’d, the Sign of which
“ Dulcification is when the Water that has
“ pass’d through it, comes from it as taste-
“ less as it was when pour’d on it. And if
“ without Filtration you would gather to-
“ gether the Flakes of this Vegetable
“ Lake, you must pour a great Quantity
“ of Water upon the Decoction after the
“ Affusion of the Alluminous Solution,
“ and you shall find the Liquor to grow
“ clearer, and the Lake to settle together
“ at the Bottom, or emerge to the Top
“ of the Water, though sometimes having
“ not pour’d out a sufficient Quantity of
“ fair Water, we have observ’d the Lake
“ partly to subside, and partly to emerge,
“ leaving all the middle of the Liquor
“ clear. But to make this Lake fit for
“ Use, it must by repeated Affusions of
“ fresh Water, be dulcified from the ad-
“ hering Salts, as well as that separated
“ by Filtration, and be spread and suffer’d
“ to dry leisurely upon Pieces of Cloth,
“ with Brown Paper, or Chalk, or Bricks
“ under them to imbibe the Moisture.”

In the Margin of this Experiment the Author refers the curious Reader for farther Information to the 7th Book of *Neri's* Art of Glass, *Englisht* and Illustrated with

with learned Observations, by the inquisitive and learned Dr *Charles Merret*, but as I have not that Book by me at present I can't oblige the Reader with a Transcript from that Book. Therefore must content myself with setting down what I have experienced from that Book, and to recommend those who are desirous to know something of *Neri's* Method, to the first nine Chapters of *Blancourt's Art of Glass*, which as near as I can remember, contain what is taught by *Neri*.

The four Annotations subjoined to this Experiment I shall not need to transcribe, as they are only Remarks on the foregoing, concerning the different Effects of the several Kinds of Salts upon the Tinctures of Vegetables and other Drugs. I shall therefore only take a cursory Notice of such Parts thereof as any Ways relate to my Design.

Part of this Experiment, and the Annotations thereon, treating of the Method of producing Lakes (as they are called) of all Colours from Vegetables according to the Doctrine of *Ant. Neri*, whose Experiments the Author praises, I shall first take the Liberty (supposing Mr *Boyle* not to have tried them all) to mention, wherein I think *Neri* has left to Posterity a wrong Account, and where my Learned Author has too much credited him; and then proceed to communicate what has occurred to me upon Tryal, particularly concerning Yellow Tinctures and Pig-

50 *Practical Improvements*

ments having already spoke of the other Colours.

I have in my Notes on some of the foregoing Experiments taken Notice that the Way of making Green and Blue Lakes from Plants is altogether useleſs, if not impracticable, ſo that I ſhall only in a few Words now ſhow, That if Mr *Boyle* had but reflected on what he himſelf ſaid in the Annotation ; ‘ that Lixivate Salts, tho’ by
 ‘ perſcing and opening the Bodies of Vegetables they prepare and diſpoſe them to
 ‘ part readily with their Tinctures, yet ſome
 ‘ Tinctures they do not only draw out, but
 ‘ likewise alter them, as might be eaſily
 ‘ made appear (ſays he) by many Experiments ſet down in the ſame Treatiſe,’ he certainly would not have ſpoke in ſuch General Terms to favour *Neri*’s Pretence to make Magiſteries or Lakes from Rue, and other the like Plants that could be uſeful and acceptable to the Artiſts. It is true, that in the latter Part of the third Annotation on this 49th Experiment ; he does declare ſome Diffidence in the Matter ; but yet, in my humble Opinion, he lays too much Streſs on the Authority of *Neri* and Dr *Merrit*’s Obſervation ; for tho’ I will allow that Green and Blue Lakes or Magiſteries may be made from ſome Deep Tinctured Juices of Plants, yet am at the ſame Time certain that they muſt change their Colours in Oyl. But as I believe

believe most of *Neri's* Disciples, as well as myself, have, at their own Expence and Trouble too often experienced the Insufficiency of his Laborious Processes, I shall leave this Subject, and go on with what I can affirm from my own Practice to be fact and practicable.

I have already, under the Article of Sap-Green shown the Way to make a fine Lemon Colour'd Tincture from that Pigment, so need only mention here, that from that Tincture, a beautiful Lake of the same Colour is to be made, that is durable as well as useful by præcipitating that Tincture with a sufficient Proportion of Allum Water, and afterwards washing off the Salts, and drying as directed in former Processes.

The second Yellow Pigment, called *Dutch Pink* is made, as before hinted, of the *French Berries of Avignon*, (used also by the Calico Printers) by infusing Twenty four Grains of them in about three Ounces of Allum Water, and after they have been boiled over or near a slow Fire, an Excellent Yellow Tincture will be procured, which (being filtered will serve for illuminating Maps, &c.) must be præcipitated with *Lixivium* of Potashes and washed to Sweetness, as formerly directed; but if the Præcipitation is performed with a *Lixivium* of Salt of Tartar, the Colour will be much the better for it, and beyond any Thing that is sold under the

52 *Practical Improvements.*

Name of Brown or Yellow Pink for Beauty, Body and Transparency, provided it is not afterwards ground up with cuttle Bone or some other Material for Lucre's Sake, by which Means, many good Colours are spoiled, such like Things making them grow fat (as the Colourmen term it) and are long in drying, which is a very bad Quality.

The Yellow made from the Turmerick mentioned by Mr *Boyle* in this Experiment is not so good in a Tincture as Saffron, and the Magistery made from it is not lasting in Oyl, the Sun soon drawing it all away as I have more than once tryed: But as a Lake in Water Colours, it may be of some Service.

Another Yellow Tincture, that is no less useful in washing and illuminating Maps and Prints, can be made from Gamboge. I know this Drugg is already used in the Water Colour Way; but it is only by dissolving it in Water, which Way I disapprove, and would by no means recommend, because of it's hurtful Quality, and therefore offer this as more eligible, useful, and on all Accounts better.

Take an equal Quantity of Gamboge and Salt of Tartar, powder them together, and dissolve in a due Proportion of boiling Water, so as to make a deep Tincture. When perfectly dissolved, let it be filtered through Paper, and put into a clean Vial for Use.

If

If it should not be glutinous of itself, and be apt to sink or spread, a little thick Gum Water may be added. This Tincture can be made to any Degree of Deepness, according to the Quantity of Water that shall be employed. The Proportions that I found to make a good Tincture, was twenty four Grains of each Ingredient in half a Pound of Water. It will serve all the Intentions of the common Way, and as the Salt of Tartar does in a great Measure correct the Acrimony of the Gamboge, it must be less attended with the bad Effects that are often occasioned by putting the Pencil in the Mouth. Another Tincture, tho' not a transparent one, may be made of this Drugg, with Spirit of Wine and Water ; but as I have before observed, That Tinctures made with a Vinous Spirit are not very useful, did not think it needful to set down the Process. There can likewise be made from the first of these Tinctures a Magistery; but it can't be used in Oyl, and differs so little from the Inspissated Juice itself, that it is not worth making.

There are many other Vegetables besides the last, (of which Mr *Boyle* takes no Notice) from which Yellow Colours can be procured, the Tinctures and Seeds of most Plants having a natural Tendency that Way ; but few of them are fine and lasting, which therefore I shall forbear to set down to prevent Expence and Trouble: Yet there is one that

54 *Practical Improvements*

that I must not pass over, and that is the Plant called *Woold* or *Weld* in *English*, and *Luteola* in *Latin*, well known to our Dyers for it's Excellent Use in dying Yellow, as any body may be farther informed by having recourse to the ingenious Mr *Miller's Gardiner's Dictionary*. If this is treated, in the Manner as directed about the *French Berries*, both a fine durable Tincture, and a Lake is made.

Thus much for Yellow ; I will now only add two Colours more, that, because of their Affinity to this, ought to be placed under this Head.

The first is a Pigment known in the Colour-Shops by the Name of *Anotto*, and is of a deep Gold Colour, inclining to Red. Twelve Grains of this, dissolved with four and Twenty Grains of Salt of Tartar in four Ounces of Water makes a noble, rich Tincture, which (when filtered) with the Addition of a little Gum Water, is useful in all Cases where a Tincture is required. Of this Tincture may also a very strong bodied Lake be made, in the same manner as other Magisteries, which tho' not to be recommended for Painting in Oyl, because it almost all flies off in a short Time, especially in the Sun ; yet may be of Service in the Miniature and Fan-painting way, to heighten other Yellows, and if rightly managed, will do the Office of Galkstone, the Colour of which it nearly resembles.

This,

This, I think, is the Drug, which the *French* call *Roucou*, and the *Dutch* *Orleaan*; and is said to be an Ingredient in that precious Colour, Carmine; tho' I very much doubt of the Truth of the Assertion, not only because the *Roucou* would shew itself as soon as the Carmine is put into Water; (for that fine Colour is not made by Præcipation as other Lakes or Powders are) but because I have some Reason to believe, that almost the whole Process of the Carmine is given wrong by all Authors that treat thereof, there being one Ingredient in it, which is easily separated from it, and is very different from any that are mention'd to be in the Composition of that Colour, as I shall take an Opportunity, (God Willing) some time or other, when I have leisure to make farther Tryals thereon, to acquaint the World with.

As to the *Roucou*, or *Anotto* itself, Those that are curious to know farther about it's Culture and Manufacture, may be satisfied by consulting Monsieur *Pomet's* History of Drugs, at the latter End of Book the 9th.

The other Drug I am to speak of is Japan Earth. Of this a Tincture is made by dissolving in Water only; but if a small Proportion of Alcalizate Salt be dissolved first in the Water it will do sooner. This may be used instead of Tincture of Soot which is very disagreeable, as many other Colours at present in Use are, in the Room of which

56 *Practical Improvements.*

I would recommend these contained in this Treatise, as more elegant and more pleasant.

Of the Tincture made with the Salt a bright brown Powder is made by præcipitating it with an Acid or Allum Water, and afterwards managed by several Ablutions and drying as in former Processes.

What this is the Juice of is as yet uncertain ; (for that it is the Juice of a Plant, tho' it still retains the improper Name of Earth, is, I believe, by every Body allowed) yet I am inclined to surmise from some Experiments I have made, that it is the concentrated or inspissated Juice of Tea, particularly of Bohea Tea, which I have found to yield a Tincture so much like the other, both in Colour and Taste, that I could not discern any Difference. I have not, indeed, tried them in the Medecinal Way, (that being out of my Province) but as the Japan Earth is a little austere on the Tongue, and leaves a sweet Flavour in the Throat, so does the Tea, and therefore I am apt to believe them originally the same : And according to the Description given of both in the Dispensatories, they agree in being Astringent and Balsamic. To conclude, I believe that if a proper Extract was made of the 'Tea so as to answer the Strength of the Japan Earth, it would in Effect appear to be the same Thing; but the Tryal hereof I will leave those Gentlemen to whom it more properly belongs, and

and content myself with giving the Hint.

Thus far I have communicated what has fallen in my Way in my Working on Mr *Boyle's* Experiments, and others of my own, thinking some of them might be profitable to those that either do, or are desirous to prepare Colours for the Limners and other Artists ; I shall only subjoin a particular Use that may be made of the before going Tinctures, which is to stain or dye Paper of all Colours, and then conclude this little Tract, with adding the Process for making the *Prussian* Blue ; not for the Sake of making that Colour, which I believe is already sufficiently known, but to teach a Way to make two or three other Colours on that Basis, with a little Variation and Addition, which has not hitherto been done by any Body else, that I know of.

The first Thing then, that I purpose to do, is to shew in what Manner Paper may be died with the before-mentioned Tinctures. To do this well it is necessary to observe that the Paper must be without Stiffning or Alum, as the filtering Paper is prepared. *Secondly*, there must be an Earthen Stone, or Wooden Shallow Trough, a little larger than a Sheet of Paper, made to contain the Tinctures : And, *Thirdly*, the Paper must be dipt in the Tincture, which will soon soak through and when hung across a Line to drain and
I dry,

58 *Practical Improvements*

dry, will be of an even Colour. After it is dry, the Paper may be stiffened and glazed fit for Fans and other Uses ; or it may be used as it is, according to what it is intended for.

N. B. Besides this Way of staining Paper, it can likewise be performed by the Juices of Flowers, Fruits and Plants, when they are fullest ; but this must be done on Paper that is already stiffened, as Writing Paper is ; because the other Sort of Paper will imbibe the Juice too much, and be unpleasant. However, this I leave to the Option of the Operator.

Now I will proceed to the last Thing I intended, *viz.* to set down the Process for making the *Prussian Blue*, in *English*, because I don't remember to have seen it published any where but in one of the Philosophical Transactions of the Royal Society, N^o 381. for the Months of *Jan.* and *Feb.* 1724. where it is inserted in *Latin* ; but chiefly because I intend to shew, as I already hinted, what is to be done on the same Basis, for making some other different Colours ; which I believe is not only unknown to the Public, but even to the Royal Society itself.

The Preparation of the Prussian Blue sent from Germany to John Woodward, M. D. Professor of Physic at Gresham College, and Fellow of the Royal Society.

TAke of crude Tartar and crude Nitre, of each four Ounces ; let them be powder'd fine, and mixt together ; then put them thus mixt in a Crucible into a Charcoal Fire till it is detonated or melted, and by this Means you will have four Ounces of extemporaneous Salt of Tartar. This Salt being yet hot, let it be gently powder'd, and add four Ounces of Ox's Blood well dryed and powder'd ; these being well mixt, put altogether into the Crucible and in the Fire till a third Part is diminished ; then being cover'd in the Fire, let the Crucible be surrounded with fresh Charcoal, that it may kindle by Degrees, and that the Materials may not flame, boil, and burn too violently. In this Manner the Materials must remain in the Fire till the Flame and Boiling ceases. After that take the Crucible from the Fire, and pour the Matter into an Iron Mortar, and let it be gently pounded ; and have at hand four Pounds of hot Rain or distill'd Water, in which put the warm Matter, and let it boil for the Space of half an Hour ; being boiled strain it thro' a Cloth, and pour fresh Water on the remaining black Matter, which set on the Fire to boil,

60 *Practical Improvements*

and strain it as before, repeating this so often till the Water comes off quite insipid, which will shew that all the Saltiness and Acrimony of the Materials is extracted. The Residue in the Cloth must be well press'd out, after which all the Liquor must be put into one Vessel, and again set on the Fire, till there remains but four Pound, which may be set by for Use, markt N^o 1.

Then take of *English* Vitriol calcin'd to Whiteness one Ounce, dissolve it in six Ounces of Rain Water, and when filter'd thro' Paper, mark it N^o 2.

Lastly, Take eight Ounces of crude Alum, and dissolve it in four Pounds of warm Water, till all is melted. This being rightly performed, join to it the Solution of Vitriol, N^o 2. and heat them on the Fire in a large Pot, to which pour the *Lixivium*, N^o 1. after it has likewise been separately heated, whereupon a strong Ebullition will ensue, and there will appear the Colour of Mountain Green or *Borax* (commonly called *Chrysocolle*.) During this Ebullition pour it several Times out of one Vessel into another, and when it ceases set it by to settle. When it is well settled, pour it into a fine Linnen Filter, that all the Water may drain off, and nothing but the Colour remain in the Cloth. When no more Water drops away, with a wooden Ladle put it out of the Cloth into a smaller Vessel; after that pour upon the Colour two
or

touching COLOURS. 61

or three Ounces of Spirit of Salt, and there will immediately appear a beautiful Blue Colour, to which, when it has stood a Night, must be put a large Quantity of clear rain, or distill'd Water, stirring it well with the Ladle, and when it is again settled the Water must be gently poured off, and fresh Water put on so often till the Water that is decanted is entirely sweet and insipid, when the Colour must be again put into a linnen Filter, and after all the Water is drain'd off, it may be spread on the Cloth, and dried by a gentle Warmth, fit for Use.

N. B. Upon the Calcination the Success of the Process wholly depends, for the light or dark Blue, and all Diversity of Colour, proceeds from the slight, midling or strong Calcination of the Blood with the Salt of Tartar.

The warm Liquors must be added together at once in the speediest Manner that can be.

Now, as from the above Process, with some small Variations, three other good and useful Colours can be made, I suppose it needless to give the whole Course of each of them, and therefore shall only mention the Particulars wherein they differ.

To make the Green you must put Sixteen Pennyweights of bruis'd *French Berries* of *Avignon* into a Pound of the Solution made with Vitriol and Allum, which must be gently boil'd after it has stood a Day to make a deep Yellow Tincture, then it must be strained

62 *Practical Improvements*

strained and added to an equal Quantity of the *Lixivium* with Blood, as is directed in making the Blue, thus you will have a good deep Green Powder, which must be also well wash'd and dried for Use, and makes a good Colour in Oyl.

The Purple is made by boiling an Ounce of powdered Cochineal in twenty Ounces of the Solution of Vitriol and Allum, and added to twenty Ounces of the *Lixivium* with Blood, proceeding in all other Respects as in making the *Prussian* Blue, except the Addition of the Spirit of Salt, which must not be used for this Colour, nor is it very necessary in the Green; unless it should be imagined that the Colour can be thereby amended.

The Yellow is made without the Blood; that is, by the Solution of Vitriol and Allum, with an equal Proportion of a *Lixivium* made with the detonated Tartar and Nitre only: but the Operation must be performed whilst the Liquors are fresh. This last Colour is also of good Use in Oyl, but will not glaze.

To these Things I might add the Processes of two beautiful and lasting Greens, the one for Limners, and the other for common Use instead of Verdigrease; and likewise a fine beautiful Scarlet Lake; but as they cost me a great deal of Labour and Expence, I can't condescend as yet to part with them to the World at so easy a Rate as the Profit of
such

such a small Treatise as this can import, so shall conclude with only saying that I hope some People will find it worth the while to introduce these Colours into Use, which I have not Leisure to do, to prevent the Mischiefs that many Artists, as well as others, that are constantly conversant with the poisonous now made, labour under, which alone will be sufficient to make me think my Time, for bringing these few Experiments together, well spent.

Additional Observations.

1. SEVERAL of the Pigments from which the foregoing Tinctures are made, may also be used for Liquid Colours by infusing them either in Limpid Water without the Help of any Kind of Salts, or in Rose-Water, in which the Colours will continue longest without growing Mottory; and by tempering these Tinctures with thick Gum-Water, which Way will be rather more agreeable and elegant for Gentleman and Ladies, who love to divert themselves with illuminating Prints and Drawings, or Painting on Silks.

2. Altho' I have hinted that Tinctures made with Spirit of Wine are of no Use for the Purposes mentioned above, yet there are several Drugs that yield deep Tinctures in that *Menstruum*; such as Cochineal, Dragon's Blood, Red and Yellow Sanders, Alkanet Root, Verdigrease, *Litmus*, and others, which will likewise communicate their Colours to fine, clear Spirit Varnishes, which may
be

64 *Practical Improvements*

be employed to varnish bright Metals, in the same Manner as the Gilders lacquer silvered Frames to imitate Gold, which is done by the Addition of some *Annotto* and Dragon's Blood to the other Ingredients that compose the Lacquer Varnish.

3. It must be observed, that in making the Tinctures for Lakes, no more of the Salts must be used than absolutely necessary, because if the *Lixiviums* are too strong they will rather impair than preserve the Colours, and because also, if the Alum Water is too much impregnated with that Salt, as it adds considerably to the Weight, (for Reasons given by Mr *Boyle* in the first Annotation) so it will at the same Time (the Powder, or *Caput Mortuum*, being of a strong Substance and White) make the Lakes much paler than they ought to be.

4. *Lastly*, All Juices from fresh gathered Herbs or Flowers are very improper for Tinctures and Lakes, because, whilst liquid, they will soon fade, and quite lose their Colour; and the Lakes made from them will hardly ever dry on Account of their inherent Salts, which always attract the Nitre of the Air, as appears by Sap-Green, Gamboge, and other inspissate Juices, that grow moist in damp, and hard in dry Weather; and for that Reason alone, grow fat, (as the Colourmen term it) when mixt or ground up with Oyl.

F I N I S.

